Jurnal Keperawatan Indonesia, 2025, 28 (1), 12–21
DOI: 10.7454/jki.v28i1.1266
Received October 2023; Accepted October 2024

pISSN 1410-4490; eISSN 2354-9203

Evaluation of the Use of Structural Gamification-Based Applications by Users in Makassar City, Indonesia

Andi Fitria Idham, Ade Putrawan, Firdi Athaya, Fitrah Ramadhan, Arnis Puspitha Rasyid*

Faculty of Nursing, Hasanuddin University, South Sulawesi 90245, Indonesia

*E-mail: arnis.puspitha@unhas.ac.id

Abstract

Structural gamification is a trending concept in today's application landscape that leverages various elements and features from game design for nongame contexts. This concept has become increasingly common in various health applications today, such as Lose It!, Fat Secret, and Google Fit. This study aims to evaluate respondents' use of structural gamification-based health applications. The research method employed in this study is quantitative and descriptive, involving data collection through questionnaires administered from July 2023 to September 2023 in Makassar City, Indonesia. The research results indicate that 90% of the respondents appreciated the ease of access and attractive interface of structural gamification-based health applications, while 35% disliked these apps' high battery consumption. The majority rated them as 8 and as 8 or 9 on a scale of 1 to 10 in terms of usefulness and effectiveness, respectively. The findings of this study are expected to provide recommendations for nursing interventions that use technology to promote healthy lifestyle modifications in public health management.

Keywords: gamification, goal-oriented, self-regulation

Abstrak

Evaluasi Pemanfaatan Aplikasi berbasis* Structural Gamification *pada Pengguna di Kota Makassar, Indonesia. Structural gamification *merupakan konsep aplikasi yang sedang tren saat ini, konsep ini memanfaatkan berbagai elemen dan fitur yang terdapat pada desain* game *untuk konteks aplikasi* non-game. *Konsep berbasis* structural gamification *semakin umum ditemukan dalam berbagai aplikasi kesehatan saat ini, seperti yang ada pada* aplikasi Lose It!, Fat Secret, Google Fit. *Riset ini bertujuan untuk mengevaluasi pemanfaatan aplikasi kesehatan berbasis* structural gamification *terhadap pengguna. Metode yang digunakan dalam riset ini adalah kuantitatif deskriptif, dengan pengumpulan data melalui kuesioner yang dilakukan pada Juli – September 2023 di Kota Makassar. Hasil penelitian menunjukkan bahwa 90% responden menyukai aspek kemudahan akses dan tampilan yang menarik, sedangkan 35% responden tidak menyukai kebutuhan baterai yang tinggi pada pengguna. Pada skala manfaat mayoritas menjawab pada skala 8 dari 10, dan pada skala efektivitas mayoritas menjawab pada skala 8 dan 9 dari 10. Temuan penelitian ini diharapkan dapat memberikan rekomendasi intervensi keperawatan yang memanfaatkan teknologi untuk modifikasi gaya hidup sehat dalam manajemen kesehatan masyarakat.*

Kata Kunci: *gamifikasi, orientasi tujuan, regulasi-diri*

Introduction

Structural gamification is a trending concept that leverages various elements and features in game design for nongame applications, such as e-commerce and educational apps. The implementation of gamification concepts has become a common strategy used by startup companies to attract potential customers and enhance their competitiveness, as seen in applications such as Shopee, Tokopedia, and Lazada (Asy'ari & Sukresna, 2023). Numerous studies have demonstrated the effectiveness of this concept in enhancing user experience and individuals' motivation to use gamification-based apps (Felita & Hardjono, 2022; Lutfina et al., 2023; Mustikasari, 2022; Susilo, 2022; Wahyuni et al., 2022).

Over time, the implementation of the structural gamification concept has become increasingly prevalent in various health applications, such as Lose It!, Fat Secret, Lifesum, and Google Fit. In several of these apps, structural gamification motivates individuals to adopt a healthy lifestyle. The method employed in this concept operates by setting specific targets or goals to be achieved. Users are then presented with various tasks and challenges to reach, often described as goal oriented (Pradana et al., 2023; Puritat et al., 2022; Soriano-Pascual et al., 2022).

Using the goal-oriented method fundamentally shares similarities with one of the health behavior theories applied in the nursing field, which is nursing self-regulation theory. In this theory, individuals undertake a series of efforts to achieve their objectives and thus attain improved health conditions. This approach aligns with the goal-oriented model in health applications, in which users are presented with various tasks and challenges to regulate their conditions and achieve their health goals (Hagger & Orbell, 2022; Holisoh et al., 2022).

These considerations have motivated the research team to evaluate the impact of structural gamification-based applications on users. On the basis of the researchers' investigation, few references that discuss user preferences in the use of structural gamification-based health apps, as well as subjective evaluations of structural gamification-based health applications by their users, are available in the literature. By identifying the impact of using health apps based on structural gamification, the results of this research are expected to serve as a foundation for designing a new application concept with a structural gamification model that aligns with user interests and evaluation outcomes. These findings can become innovations in modern nursing interventions that use renewable technology. The focus of the nursing intervention targeted by this structural gamification model is lifestyle modification through the habituation of positive physical activities. This research will involve identifying various structural gamification-based applications used by the public. It will analyze the aspects liked and disliked by users and determine the benefits and effectiveness of these applications.

Methods

The method employed in this study is quantitative. The research was conducted in the city of Makassar, Indonesia, from July 2023 to October 2023. The study comprised two phases: screening and evaluating health applications based on structural gamification. In the initial phase, the researchers distributed questionnaires randomly to residents of Makassar, both online and offline, particularly at the car-free day and sports park locations in Makassar City. The primary goal of this phase was to identify individuals who use health applications based on structural gamification. Subsequently, the researchers inquired about the willingness of respondents who use health applications based on structural gamification to proceed to the next phase of the study. Out of 75 individuals using health applications based on structural gamification, 50 agreed to continue to the next phase of the research. Following this, the researchers distributed self-developed evaluation questionnaires to the consenting respondents.

The determination of these components is based on the characteristics of the respondents who have previously used health applications based on structural gamification. Therefore, these individuals are considered sufficiently familiar with the components of health applications using structural gamification. The details of the questionnaire used in this study cover aspects of the health applications that users like (aspects that can increase their desire to use health applications with structural gamification), aspects that they dislike (aspects that may reduce their interest in using health applications with structural gamification), the subjective usefulness of structural gamification-based health applications, and the subjective effectiveness of such applications in fostering a healthy lifestyle.

Regarding usefulness and effectiveness, respondents used a scale from 1 to 10, with 1 indicating least useful/effective and 10 indicating most useful/effective. This scale provides a general overview of whether health applications based on structural gamification can truly be beneficial in modifying users' lifestyles toward healthy habits.

Results

The team obtained satisfactory results after conducting research activities for two months. From the statistical analysis conducted, out of a total of 205 respondents who were generally representative of the residents of Makassar City, Indonesia, and were encountered by the researchers during data collection at the car-free day and sports park locations in Makassar City, 75 (36.6%) used structural gamification-based health applications. The remaining (130 individuals; 63.4%) did not use structural gamification-based health apps.

Furthermore, of the 75 respondents who were identified as using structural gamification-based health applications, the team asked their willingness to become respondents for the next research stage, which was the evaluation of the aspects of structural gamification-based health applications. Fifty respondents were willing to continue in the next stage. In this research phase, the researchers identified the respondents' preferred aspects of structural gamification-based health applications, the disliked aspects, the usefulness of such apps, and their effectiveness.

In Table 1, regarding the aspects that the respondents liked about the applications, they could choose more than one aspect. The majority of the respondents, namely, 36 out of 40 individuals (90%), liked the aspects of easy access and attractive appearance. This shows that the respondents appreciated the level of ease of access to the apps, so it is hoped that the release of similar applications via Google Play Store and App Store can continue. The login and sign-up menu in the applications was also one of the components included in the ease of application access. In the future, it is hoped that health apps based on structural gamification will continue to make application access easy, such as through a single sign-up feature. Based on previous studies, this feature helps increase user participation and better security (Aini et al., 2018; Jadhav et al., 2020).

The appearance of the applications was the most preferred aspect by the respondents. The appearance of an app can include the icons used, the organization of the menu, the color palette selection, and various other components. However,

Table 1. Preferred Aspects

Preferred Aspects	n	%
Ease of Access	36	90
Attractive Interface	36	90
Diverse Features	34	85
Use of Gamification Methods	18	45

Table 2. Aspects Disliked

Aspects Disliked	n	%
Challenging to use/complicated	5	12.5
Requires internet data	12	30.0
Premium feature access	9	22.5
High battery consumption	14	35.0
Total	40	100

researchers have not yet examined in depth the aspects of display that influence user preferences the most. It is hoped that further research will be able to identify these. Another aspect that many respondents also preferred the most was feature diversity. This refers to the features of structural gamification-based health applications, including features for calculating and recommending physical activity, calculating calories burned and total calories consumed, making recommendations on daily food menus, and other features related to effort and promoting a healthy lifestyle. However, as researchers have not identified any further features that users need the most regarding their health conditions, it is hoped that future research will be able to address this research gap.

In Table 2, regarding the disliked aspects of the app, the respondents could also select more than one aspect. The majority of the respondents disliked the aspect of high battery consumption (14 individuals; 35%). This shows that upgrading the type of technology used in structural gamification-based health apps can actually increase battery requirements, so innovation is needed in this regard. Even so, the research team cannot accurately ascertain the components of structural gamification-based health apps that increase battery consumption, so further research is needed for this evaluation.

In the second position, the need for internet access was chosen by 12 individuals (30%); followed by the need for premium access, chosen by nine individuals (22%); and difficulty of using the application because of its complex features, chosen by five individuals (12.5%). The latter finding indicates that although they are few, some individuals still find it challenging to use structural gamification-based health applications because of difficulty navigating their features. Future applications are expected to adjust to the overall ability of users.

The respondents used a scale ranging from 1 and 10 to rate the usefulness of structural gamification-based health applications, in which a score of 1 indicated the lowest level of usefulness (least valuable), and a score of 10 indicated the highest level of usefulness (most helpful). The majority of the respondents chose a score of 8 (16 individuals; 32%), followed by a score of 7 (11 individuals; 22%). The lowest score chosen by the respondents was 4 (one individual; 2%) (Table 3). The results of this overall assessment show that the majority of the respondents felt that structural gamification-based health applications are very useful. This finding can be used as a basis for the sustainable use of structural gamification-based health application models in the future. Note that some respondents also chose the maximum score of 10 (five individuals; 10%), reflecting their high levels of satisfaction with the usefulness of the applications.

The respondents used a scale of 1 to 10 to rate the effectiveness of structural gamification-based health applications, in which a score of 1 indicated the lowest level of effectiveness (least effective), and a score of 10 indicated the highest level of effectiveness (most effective). The majority of the respondents chose scores of 8 and

Table 3. Application Benefit Scale

Application Benefit Scale	n	%
4	1	2.0
5	5	10.0
6	4	8.0
7	11	22.0
8	16	32.0
9	8	16.0
10	5	10.0
Total	50	100

Table 4. Application Effectiveness Scale

Application Effectiveness Scale	n	%
4	3	6.0
5	4	8.0
6	4	8.0
7	10	20.0
8	12	24.0
9	12	24.0
10	5	10.0
Total	50	100

and 9, with 12 individuals each (24%) (Table 4). Note that the effectiveness parameter in this question refers to how health apps based on structural gamification can have positive effects on user's lifestyles, for example, in the form of increasing the amount of physical activity, reducing weight, and other components. Even so, there was still a small portion of the respondents (three individuals; 6%) who chose a score of 4 for the effectiveness of structural gamification-based health applications. This finding needs to be examined further to determine why some users felt that health applications based on structural gamification do not have a positive impact on fostering healthy lifestyles. In contrast to this result, five respondents (10%) gave the maximum score of 10 for the level of effect-tiveness of structural gamification-based health applications. Regarding these differences, identifying the causes of variations is also necessary because the types of apps used by the respondents who gave high and low scores may vary.

Discussion

Gamification is a concept that emerged in the era of digitalization. It is the integration of features found in video games into nongame contexts, such as learning, work, and other areas of life, with the aim of increasing the motivation and involvement of certain parties. Various studies have shown that using gamification methods can increase a person's motivation and engagement (Alsawaier, 2018; Basit et al., 2021; Fadhli et al., 2020; Rahmani, 2020). One type of gamification commonly used is structural gamification. In this type of gamification, game elements are added to the structure, but the content is not modified. The ultimate goal of structural gamification is to encourage users through the learning process so that they can solve other challenges. The benefits obtained at the end of each challenge will motivate users to complete the entire challenge (Designing Digitally, 2019; Mustikasari, 2022).

There are various forms of implementing structural gamification, such as progression-based games, badge-based games, casual games, and competition games. In development-based games, users set goals to achieve and then go through each step necessary to achieve the desired goals (goal oriented). In badge-based games, users are awarded badges depending on their competency levels, which are then displayed on their digital profiles to motivate them. In casual games, users are given the opportunity to play the game before undertaking a challenge, so they are stuck reading the desired content. In the last type, competition games, users are asked to compete with other users to receive certain prizes, thus increasing their motivation (Designing Digitally, 2019; Filatro & Cavalcanti, 2016).

Structural gamification is a concept that uses elements from video games intended to motivate individuals. The gamification model within applications allows for direct feedback on progress and rewards for completed tasks. As a result, the gamification concept in applications has a highly positive effect on user engagement (Kresnayana et al., 2023; Sukmasetya et al., 2022). The components used in the structural

gamification concept typically encompass several features, including leaderboards, points, badges, social connections, levels, and reputation (Destriani & Heroza, 2023).

Leaderboards are used to help determine the performance levels or achievements of other players and create competitiveness. Point systems, scores, and other means aimed at stimulating and encouraging expected behaviors include opportunities to win prizes and earn points. Badges, a key element of gamification, are the rewards or recognition given to players as tokens of appreciation when they complete specific challenges or missions. This recognition can come in the form of badges indicating the level of achievement reached. Social connection or social interaction with fellow players on the internet fosters competition and motivation in gameplay. A player's achievement is marked by different levels, indicating their reputation.

Gamification is also applied in health education. Health is crucial in life, and encountering obstacles in healthcare can be perilous for survival (Carolus & Gormantara, 2022). Many studies have applied gamification in various sectors, making gamification a popular subject, especially in healthcare. It has been used to provide therapy for teenagers with mental health issues, rehabilitate patients through physical training, and teach individuals how to get quality sleep and maintain proper sleep habits (Christie et al., 2019; Schez-Sobrino et al., 2020).

Numerous studies have shown that structural gamification-based health applications benefit users' healthy behaviors. However, some factors influence their effectiveness, which aligns with the research that our team conducted to evaluate the implementation of structural gamification-based applications. The context of structural gamification in these applications aims to promote a healthy lifestyle. Various things can be done to observe healthy living behaviors, such as maintaining a healthy food intake with a mindful eating approach or eating with attention. This focuses on the experience of eating, sensations related to the body, and thoughts and feelings about food with high awareness.

Based on World Health Organization (WHO) guidelines, an adult is advised to consume a minimum of five servings of vegetables and fruits per day (400 grams), limit their total energy intake of sugar to around 12 teaspoons, limit energy intake from fat to less than 30%, and limit salt consumption to up to 5 grams per day (Hu et al., 2021; WHO, 2019). Another component included in healthy living behavior is physical activity. Being physically active does not always need to be done with intense exercise; it can be done by walking, light jogging, or choosing to take the stairs instead of the elevator. One of the obstacles faced in carrying out physical activity is the lack of time or energy, the lack of a suitable place, and the lack of motivation to carry it out (Centers for Disease Control and Prevention, 2021).

The research findings show that ease of access and an appealing interface are the aspects most favored by the respondents in health applications based on structural gamification. This outcome significantly differs from those of previous research, such as that conducted by Al-Shamaileh and Sutcliffe (2023) regarding the factors influencing user application preferences. They found that usefulness and usability were the most influential factors in user application selection. Additionally, they determined that the design of the application interface was, in fact, the least influential factor in user application preferences. This disparity may potentially be attributed to variations in the types of applications studied. Nevertheless, further research on a large demographic is required to validate these results.

In the present study, the authors also identified aspects in health applications based on structural gamification that are disliked by the respondents. These are high battery consumption and the requirement for internet data to access the applications. Conversely, previous research

has indicated different factors causing dislike of an application, such as symbolic, functional, and moral avoidance. Further research is needed on a broad segment of the population regarding the factors that can lead to users' dislike of applications (Islam et al., 2020).

The usefulness of the applications was also investigated in this research. The results revealed that the majority of the respondents rated the health applications based on structural gamification as 8 (on a scale of 1 to 10) in terms of usefulness. Regarding previous research, no inquiry has been made by other scholars into the usefulness of health applications based on structural gamification. However, prior research has explored the benefits of digital health technology, mainly digital health applications, for individuals at risk of diabetes. Research findings indicate that the effectiveness of health applications for diabetes lacks evidence to prove clinical validity, effectiveness, accuracy, and safety. Nevertheless, researchers revealed that the infrequent use or lack of use of these applications is a consequence of technological issues, interoperability issues, and demographic differrences (Fleming et al., 2020).

Furthermore, the findings of this study broadly encompass four aspects: aspects of structural gamification-based health applications that are liked, aspects that are less liked, the usefulness of these applications, and their subjective effectiveness. These four components can serve as a foundation for improving and adjusting existing structural gamification-based health applications to enhance visual aspects, ensuring that the focus is not only on the content but also on the application's visual design (including app design, app model, color choices, and themes used in the app). Additionally, efforts should be made to reduce battery consumption, which is based on the feedback provided by current users of structural gamification-based health applications.

Aside from being a foundation for improving existing application models, these research findings can also serve as an initial basis for designing an updated structural gamification-based health application that aligns with user preferences. However, an in-depth identification of the components and details desired by the general public remains important. Whether through adjusting existing application models or creating a new concept for a structural gamification-based health application, this represents an effort to provide nursing interventions, particularly healthy lifestyle modification interventions, aimed at improving health management. The details of the healthy lifestyle modification intervention that can be built through structural gamification-based health applications include following a diet that meets the body's needs, exercising regularly, and maintaining mental health, reproductive health, and oral hygiene, all through various challenges and goals within the application. This intervention is expected to be a form of modified nursing intervention that uses modern technology to transform and promote a healthy lifestyle in the community.

Conclusion

This study aims to identify four aspects: the most preferred aspects of health applications based on structural gamification, their least preferred aspects, the usefulness of these health apps, and their effectiveness, as perceived by users. The results indicate that the most favored aspects of a health application based on structural gamification are ease of access and an appealing interface. Regarding the least preferred aspects, the majority of the respondents identified high battery consumption and the need for internet access. In terms of usefulness, the respondents mostly selected ratings of 7 and 8 out of 10. Therefore, it can be concluded that health applications based on structural gamification are considered sufficiently beneficial by the respondents. For the last component, effectiveness, the majority of the respondents chose ratings of 8 and 9 out of 10. This implies that most of them believed that health applications based on structural gamification are practical in promoting a healthy lifestyle.

These findings lead the authors to recommend the future development of health applications based on structural gamification, taking into consideration the evaluated components in this study to create apps that align with the interests and perceptions of the community. The results of this study can further serve as a foundation for nursing interventions aimed at achieving healthy lifestyle modifications and health management nursing outcomes. This form of intervention, delivered through structural gamification-based health applications, is expected to become a nursing intervention model that leverages modern health technology to improve the overall health status of the community.

Acknowledgements

The authors would like to thank all those who have helped in the preparation of this article. The authors would like to thank the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia, as well as Hasanuddin University for providing grant funding for this research under contract no. 2383/E2/DT.01.00/2023 in the year 2023.

References

Aini, Q., Rahardja, U., & Naufal, R.S. (2018). Penerapan Single Sign On dengan Google pada website berbasis YII Framework. *Jurnal Ilmiah Sistem Informasi dan Teknik Informatika*, *8* (1), 57–68. doi: 10.30700/jst.v8i1.161.

Alsawaier, R.S. (2018). The effect of gamification on motivation and engagement. *The International Journal of Information and Learning Technology*, *35* (1), 56–79. doi: 10.1108/IJILT-02-2017-0009.

Al-Shamaileh, O., & Sutcliffe, A. (2023). Why people choose apps: An evaluation of the ecology and user experience of mobile applications. *International Journal of Human-Computer Studies*, *170*, 102965. doi: 10.1016/j.ijhcs.2022.102965.

Asy'ari, A.R.N., & Sukresna, M.I. (2023). Pengaruh prinsip gamification terhadap loyalitas merek dengan keterlibatan pelanggan sebagai variabel intervening (Studi pada pengguna Lazada di Kota Semarang). *Diponegoro Journal of Management*, *12* (2), 1–15.

Basit, A., Hassan, Z., Omar, N., Sethumadavan, S., & Jhanjhi, N.Z. (2021). Gamification: A tool to enhance employee engagement and performance. *Turkish Online Journal of Qualitative Inquiry*, *12* (5), 3251–3269.

Carolus, R.Y., & Gormantara, A. (2022). Penerapan gamification dalam bidang pendidikan formal dan nonformal: Survey paper. *KONSTELASI: Konvergensi Teknologi dan Sistem Informasi*, *2* (2), 352–365. doi: 10.24002/konstelasi.v2i2.5369.

Centers for Disease Control and Prevention. (2021). *Guide to healthy living: Physical health*. Retrieved form: https://www.cdc.gov/cancer-survivors/healthy-living-guides/index.html

Christie, G.I., Shepherd, M., Merry, S.N., Hopkins, S., Knightly, S., & Stasiak, K. (2019). Gamifying CBT to deliver emotional health treatment to young people on smartphones. *Internet Interventions*, *18*, 100286. doi: 10.1016/j.invent.2019.100286.

Designing Digitally. (2019). *Structural gamification and content gamification*. Retrieved from: https://www.designingdigitally.com/blog/structural-gamification-and-content-gamification

Destriani, R., & Heroza, R.I. (2023). Penerapan design thinking dengan gamifikasi guna meningkatkan motivasi konsumsi buah dan sayur pada anak. *Jurnal Tekno Kompak*, *17* (1), 81–95. doi: 10.33365/jtk.v17i1.2121.

Fadhli, M., Brick, B., Setyosari, P., Ulfa, S., & Kuswandi, D. (2020). A meta-analysis of selected studies on the effectiveness of gamification method for children. *International Journal of Instruction*, *13* (1), 845–854. doi: 10.29333/iji.2020.13154a.

Felita, C., & Hardjono, R.K. (2022). Open innovation: Analisis gamification terhadap

intention of engagement dan brand attitude. *Jurnal Bisnis dan Manajemen*, *9* (1), 94–108. doi: 10.26905/jbm.v9i1.7634.

Filatro, A., & Cavalcanti, C.C. (2016). Structural and content gamification design for tutor education. *Proceedings of E-Learn: World Conference on E-Learning* (pp. 1152–1157). Association for the Advancement of Computing in Education (AACE). Retrieved from: https://www.learntechlib.org/primary/p/1740 55/.

Fleming, G.A., Petrie, J.R., Bergenstal, R.M., Holl, R.W., Peters, A.L., & Heinemann, L. (2020). Diabetes digital app technology: Benefits, challenges, and recommendations. A consensus report by the European Association for the Study of Diabetes (EASD) and the American Diabetes Association (ADA) Diabetes Technology Working Group. *Diabetes Care*, *43* (1), 250–260. doi: 10.2337/dci19-0062.

Hagger, M.S., & Orbell, S. (2022). The common sense model of illness self-regulation: A conceptual review and proposed extended model. *Health Psychology Review*, *16* (3), 347–377. doi: 10.1080/17437199.2021.187 8050.

Holisoh, A., Anriani, N., & Nurhalimah, N. (2022). Evaluasi pelaksanaan prakerin (prektek kerja industri) di salah satu SMK di Tangerang dengan pendekatan goal oriented evalution model. *Gema Wiralodra*, *13* (2), 799–805. doi: 10.31943/gw.v13i2.297.

Hu, F., Cheung, L., Otis, B., Oliveira, N., & Musicus, A. (2021). *Healthy living guide 2020/2021*. Harvard T.H. Chan School of Public Health, Department of Nutrition. Retrieved from: https://nutritionsource.hsph.harvard.edu/2021/01/19/healthy-living-guide-2020-2021/

Islam, T., Li, J., Ali, A., Xiaobei, L., Sheikh, Z., & Zafar, A.U. (2020). Mapping online app hate: Determinants and consequences. *Telematics and Informatics*, *51*, 101401. doi: 10.1016/j.tele.2020.101401.

Jadhav, S., Mane, S., Chandvale, S., Bhagywant, C., & Bidkar, D. (2020). Password less authentication using Single Sign On (SSO). *International Journal of Advanced Science and Technology*, *29* (12), 2781–2789.

Kresnayana, M.Y., Ibrahim, K., Dhamayanti, M., & Pramukti, I. (2023). Efektivitas gamifikasi dalam pendidikan keperawatan masa pandemi: Literatur review. *Prosiding Simposium Kesehatan Nasional*, *2* (1), 198–204.

Lutfina, E., Setiawan, R.O.C., Nugroho, A., & Abdillah, M.Z. (2023). Perancangan aplikasi pembelajaran dengan konsep gamifikasi: Systematic literature review. *METHOMIKA: Jurnal Manajemen Informatika dan Komputerisasi Akuntansi*, *7* (1), 78–87. doi: 10.46880/jmika.vol7no1.pp78-87.

Mustikasari, A. (2022). The influence of gamification and rewards on customer loyalty in Z Generation with moderating role of gender (Case study on the Shopee marketplace). *Management Analysis Journal*, *12* (2), 174–181. doi: 10.15294/maj.v11i2.57049.

Pradana, F., Setyosari, P., Ulfa, S., & Hirashima, T. (2023). Development of gamification-based e-learning on web design topic. *International Journal of Interactive Mobile Technologies*, *17* (03), 21–38. doi: 10.3991/ijim.v17i03.36957.

Puritat, K., Thongthip, P., Jansukpum, K., Sirasakamol, O., & Nadee, W. (2022). Camtrun: Gamified fun run events for promoting physical activity. *International Journal of Interactive Mobile Technologies*, *16* (18), 94–113. doi: 10.3991/ijim.v16i18.32897.

Rahmani, E.F. (2020). The benefits of gamification in the english learning context. *Indonesian Journal of English Education*, *7* (1), 32–47. doi: 10.15408/ijee.v7i1.17054.

Schez-Sobrino, S., Vallejo, D., Monekosso, D.N., Glez-Morcillo, C., & Remagnino, P. (2020). A distributed gamified system based on automatic assessment of physical exercises to promote remote physical rehabilitation. *IEEE Access*, *8*, 91424–91434. doi: 10.1109/ACCESS.2020.2995119.

Soriano-Pascual, M., Ferriz-Valero, A., García-Martínez, S., & Baena-Morales, S. (2022).

Gamification as a pedagogical model to increase motivation and decrease disruptive behaviour in physical education. *Children, 9* (12), 1931. doi: 10.3390/children9121931.

Sukmasetya, P., Agustian, B., Nurlatifah, L., Yudianto, M.R.A., & Hasani, R.A. (2022). Penerapan gamification pada aplikasi edukasi pertolongan pertama pada kecelakaan (Smart P3K) guna tingkatkan literasi penanganan medis. *Information System for Educators and Professionals: Journal of Information System, 6* (1), 57–66. doi: 10.51211/isbi.v6i1.1791.

Susilo, C.L. (2022). The effect of gamification towards repurchase intention in e-commerce platform with Technology Advancement Model (TAM) as moderating variable. *Jurnal Manajemen Bisnis dan Inovasi Universitas Sam Ratulangi, 9* (2), 689–702. doi: 10.35794/jmbi.v9i2.42391.

Wahyuni, F.A., Oktavia, M., & Fakhrudin, A. (2022). Efektivitas model pembelajaran quantum teaching and learning berbasis gamification terhadap minat belajar siswa. *Journal on Teacher Education, 4* (2), 581–593. doi: 10.31004/jote.v4i2.8557.

World Health Organization (WHO). (2019). *Healthy diet*. World Health Organization Regional Office for The Eastern Mediterranean. Retrieved from: https://applications.emro.who.int/docs/EMROPUB_2019_en_23536.pdf?ua=1